

## AUDIO RACK FOR A VEHICLE

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to audio rack for a vehicle, into which a plurality of pieces of electrical equipment are removably installed.

#### 2. Description of the Related Art

In art related to the present invention, a plurality of pieces of audio equipment are installed in a center cluster module at the front part of a vehicle.

### SUMMARY OF THE INVENTION

~~Pieces of electrical equipment that have different functions often have diverse shapes and dimensions. For example, there are items such as a CD drive, which has a large width and small height, and cassette or MD drives, which have a small width but a large height. To accommodate such equipment, there are standards, such as DIN, for the center cluster module storage area for this equipment, which set forth specifications for size and shape. In general, each of the storage locations is established to have the same size and shape. For this reason, when a CD drive is inserted into a storage location, there is a considerable wasted space in the height direction, and when a cassette drive is inserted, there is considerable wasted space in the width direction.~~

Accordingly, it is an object of the present invention to

provide an audio rack for a vehicle which makes effective use of storage space for electrical equipment.

To achieve the above-noted object, an audio rack according to the present invention has a first storage location and a second storage location. The first storage location accepts a first piece of electrical equipment that has a first width size, and the second storage location is located either above or below the first storage location, and accepts a second piece of electrical equipment, which has a second width that is smaller than the first width size.

By adopting the above-noted arrangement, because the first and second storage locations have widths to accommodate pieces of electrical equipment that are mutually different in width, not only is it possible to make effective use of the storage space within the audio rack, but also the audio rack features expandability.

The audio rack of the present invention can further have a controller and a connection unit. The controller is located in the space within the audio rack that is not occupied by the first and second storage locations. The connection unit provides electrical connections between the first electrical equipment that is housed in the first storage location and the controller, and between the second electrical equipment that is housed in the second storage location and the controller. The controller performs control of the first and second electrical equipment via the connection unit.

According to the above-noted arrangement, because the controller is located in the space within the audio rack that is not occupied by the first and second storage locations, it is

possible to make effective use of the space within the audio rack.

The connection unit can further have a first connector, which is connected to the first electrical equipment in the first storage location and a second connector, which is connected to the second electrical equipment in the second storage location.

The first and second connectors can be fixed with respect to the audio rack. The first connector can be electrically connected to a connector of the first electrical equipment by the action of inserting the first electrical equipment into the first storage location, and the second connector can be electrically connected to a connector of the second electrical equipment by the action of inserting the second electrical equipment into the second storage location.

The audio rack can further have a pair of first guides and a pair of second guides. The first guides are provided on inner surfaces at the left and right sides of the first storage locations, and slidably support the first electrical equipment. The second guides are provided on inner surfaces at the left and right sides of the second storage locations, and slidably support the second electrical equipment. The first guides guide the insertion of the first electrical equipment into the first storage location, and establish the position of the first electrical equipment in the width and height directions. The second guides guide the insertion of the second electrical equipment into the second storage location, and establish the position of the second electrical equipment in the width and height directions. The first and second connectors can have substantially the same shape. The distance between one of the first guides and the first connector in the width direction can be made equal to the distance between one of

the second guides on the same side of thereof as the one guide of the first guides and the second connector in the width direction. The distance in the height direction from the above-noted one first guide and the first connector can be made equal to the distance in the height direction from the above-noted one second guide and the second connector.

The above-noted audio rack can further have a spacer that is removably fixed with respect to the second electrical equipment at either the right or left side thereof. When a second electrical equipment, which is provided with a spacer, is inserted into the first storage location, it is slidably supported by the above-noted one first guide, with the other first guide slidably supporting the spacer. As the second piece of electrical equipment, which has the spacer, is inserted into the first storage location, the first connector makes an electrical connection with the above-noted connector on the second electrical equipment.

According to the above-noted arrangement, it is possible to install the second electrical equipment in the first storage location the same manner in which the first electrical equipment is installed therein.

The above-noted audio rack can further have a spacer that is removably fixed with respect to a third piece of electrical equipment that has a third width size that is smaller than the first width size, at either the right or left side thereof. When a third electrical equipment, which is provided with this spacer, is inserted into the first storage location, it is slidably supported by the above-noted one first guide, with the other first guide slidably supporting the spacer thereof. As the third piece of electrical equipment, which has the spacer, is inserted into

the first storage location, the first connector makes an electrical connection with the above-noted connector on the third electrical equipment

According to the above-noted arrangement, it is possible to install the third electrical equipment, which has the third width size, in the first storage location the same manner in which the first electrical equipment is installed therein.

The first guides can have grooves that can mate with protrusions on the first electrical equipment, and the second guides can have grooves that can mate with protrusions on the second electrical equipment.

The first storage location can be made to accept a first electrical equipment that has a first height size, and the second storage location can be made to accept a second electrical equipment, which has a height size that is larger than the first height size.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front view of an audio rack into which are inserted a plurality of pieces of electrical equipment.

Fig. 2 is a front view of an audio rack from which the electrical equipment has been removed.

Fig. 3 is a perspective view that shows the condition in which the operating panel has been removed from the audio rack.

Fig. 4 is a front view that show the audio rack in the condition in which a different piece of electrical equipment has been installed in the second storage location.

Fig. 5 is a front view that shows the audio rack in the condition in which yet a different piece of electrical equipment

has been installed in the second storage location.

Fig. 6 is a exploded perspective view of Fig. 5.

Fig. 7 is a block diagram that shows the configuration of the audio panel, electrical equipment, and operating panel.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of an audio rack according to the present invention are described in detail below, with reference to relevant accompanying drawings.

As shown in Fig. 1, Fig. 4, and Fig. 5, a vehicular audio rack 61 for the purpose of removably installing a plurality of pieces of electrical equipment 66, 69, and 81 has a fixed width size and a fixed height size, these fixed width and height sizes being set forth as DIN standards.

The vehicular audio rack 61 has a first storage location 62 at the top, and a second storage location 63 at the bottom. The inside part of the audio rack 61 at the lower left part thereof is divided by a dividing wall 64, the second storage location being disposed to the right side of this dividing wall 64.

The first storage location 62 can have inserted into it a piece of electrical equipment (the first electrical equipment) 66, such as a CD drive, which has a first width size that is substantially the same as the above-noted fixed width size and a first height size that is substantially the same as the above-noted fixed height size. The left and right inner surfaces of the first storage location 66 have linear guide grooves (first guides) 65a and 65b formed therein.

On the front surface of the electrical equipment 66, there is formed a medium insertion port 66a, for the purpose of inserting

a CD or the like thereinto. On the right and left side surfaces of the electrical equipment 66 are formed rails (protrusions) 67a and 67b, which mate with the guide grooves 65a and 65b. By the action of the rails 67a and 67b sliding in the guide grooves 65a and 65b, the electrical equipment 66 is guided into the first storage location 62.

The second storage location 63 can have inserted into it a piece of electrical equipment (the second electrical equipment) 69, such as an MD drive, which has a second width size that is smaller than the above-noted fixed width size and a second height size that is larger than the above-noted fixed height size. The left and right inner surfaces of the second storage location 63 have linear guide grooves (second guides) 68a and 68b formed therein.

On the front surface of the electrical equipment 69, there is formed a medium insertion port 69a, for the purpose of inserting a cassette or the like thereinto. On the right and left side surfaces of the electrical equipment 69 are formed rails (protrusions) 70a and 70b, which mate with the guide grooves 68a and 68b. By the action of the rails 70a and 70b sliding in the guide grooves 68a and 68b, the electrical equipment 69 is guided into the second storage location 63.

The second storage location 63 can be located above the first storage location 62.

A control board (controller) 71 for the purpose of controlling the electrical equipment 66 and 69 that are housed in the storage locations 62 and 63 is disposed inside the dividing wall 64, which is the space other than that occupied by the first storage location 62 and the second storage location 63,

As described above, because the audio rack according to the present invention has first and second storage locations 62 and 63 with width sizes that accommodate electrical equipment 66 and 69, which have different widths, it is not only possible to make effective use of the space within the audio rack 61, but also the expandability of the audio rack 61 is enhanced. Additionally, because the control board 71 is disposed within the dividing wall 64, it is possible to maximum the effective use of the space within the audio rack 61.

As shown in Fig. 3, a bus board 73 is disposed at the rear side of the electrical equipment 66 and 69 in the audio rack 61, and the control board 71 is electrically connected to this bus board 73.

As shown in Fig. 2, receiving connectors 79 and 80 (shown in Fig. 2) protrude toward the first and second storage locations 62 and 63 from the bus board 73. The receiving connector 79 is removed by X1 in the right side in the width direction from the upper left guide groove 65b as a reference, and is removed by Y1 therefrom in the downward height direction. The receiving connector 80 is removed by X2 in the right side in the width direction from the lower left guide groove 68b as a reference, and by Y2 therefrom in the in the downward height direction. The dimensions X1 and X2 are established as the same, and the dimensions Y1 and Y2 are established as the same.

The receiving connectors 79 and 80 and the bus board 73 form the connection unit 94.

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the rear surface of the electrical equipment 66 automatically makes connection with the receiving connector 79. By means of this action, the electrical equipment 66 within the first storage location 62 is electrically connected to the control board 71 via the receiving connector 79 and the bus board 73.

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In the same manner, when the rails 70a and 70b are slid into the guide grooves 68a and 68b so as to insert the electrical equipment 69 into the second storage location 63, the connector 50, which protrudes from the rear surface of the electrical equipment 69 automatically makes connection with the receiving connector 80. By means of this action, the electrical equipment 69 within the second storage location 63 is electrically connected to the control board 71 via the receiving connector 80 and the bus board 73.

Each of the connectors 50 are disposed in positions that correspond with the receiving connectors 79 and 80.

As shown in Fig. 3, an operating panel 74 for the purpose of operating the electrical equipment within the audio rack 61 is removably mounted to front surface of the vehicular audio rack 61. The operating panel 74 has operating switches 75 and 76, and medium insertion ports 77 and 78, which correspond to the positions of the medium insertion ports 66a and 69a on the electrical equipment 66 and 69.

By removing the operating panel 74 from the vehicular audio rack 61, the first and second electrical equipment 62 and 63 can be replaced by other electrical equipment.

Fig. 4 shows the case in which pieces of electrical equipment (the first and third electrical equipment) 81 having the above-noted second width size and the above-noted first height

size are inserted into the second storage location 63. An example of this electrical equipment 81 is a radio amplifier. Of the elements that make up the electrical equipment 81, elements that are in common with the electrical equipment 69 have been assigned  
5 the same reference numerals, and will not be described herein.

In the above-noted case, when the rails 70a and 70b are slid in the guide grooves 68a and 68b so that the electrical equipment 81 is inserted into the second storage location 63, the connector 50, which protrudes from the rear surface of the electrical  
10 equipment 81 automatically makes connection with the receiving connector 80. By means of this action, the electrical equipment 81 within the second storage location 63 is electrically connected to the control board 71 via the receiving connector 80 and the bus board 73.

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~~Fig. 5 and Fig. 6 shows the cases in which, because the width size of the electrical equipment 81 is not suitable for the first storage location 62, a mounting stay (spacer) 83 is mounted to the right side of the electrical equipment 81.~~

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~~The total width size of the second width size of the electrical equipment 81 and the width size of the mounting stay 83 is established so as to be equal to the first width size. On the right side of the mounting stay 83 is formed a rail (protrusion) 84a that mates with the guide groove 65a. By the rail 84a and the rail 70b on the left side of the electrical equipment 81 sliding in the guide grooves 65a and 65b, the electrical equipment 81 is  
25 guided into the second storage location 63.~~

Because the electrical equipment 81 can be selectively inserted into the upper first storage location 62 or the lower second storage location 63, there is an increase in the electrical

equipment from which the user can select. Therefore, a vehicular audio rack is provided that has good expandability. In this case, the mounting stay 83 can be used to mount other electrical equipment for expansions, such as a radio with a visual display.

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As shown in Fig. 7, the audio rack 61 has a controller (control board) 71, a first storage location 62, a second storage location 63, and a connection unit 94. Electrical equipment such as a cassette 69, a CD drive 66, an MD drive 95, and a radio amplifier 81 can be inserted into the first storage location 62 and the second storage location 63.

The operating panel 74 has a display 91 and operating switches 92 (75 and 76 as shown in Fig. 3), the user operating these switches 92 so as to cause a operating signals to be output to the controller 71.

The controller 71 controls the electrical equipment that is housed in the storage locations 62 or 63, via the connection unit 94, and in accordance with operating signals.

It should be noted that the present invention is not restricted in application to the vehicular audio rack noted in the foregoing embodiment. Additionally, while in the embodiment there were two storage locations, positioned one above the other, in the case in which pieces of electrical equipment having quite a small height is to be installed, a vertically stacked three-level arrangement can also be used.

Note also that there is no restriction in the present invention to type of electrical equipment noted in the embodiment, and other types of electrical equipment can be used as well. In addition, it will be understood that other variations of the present invention are possible within the technological scope of

the present invention.

the present invention.